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DISCOVER THE GIANTS OF THE PREHISTORIC WORLD

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DRACOPELTA

Plant-eating *Dracopelta* had lots of bony armour to protect it from hungry predators.

Portugal was the home of several types of plant-eating dinosaur during the Late Jurassic and Early Cretaceous Periods. The fossil remains of *Hypsilophodon*, *Camptosaurus* and *Iguanodon* have been found there. Among the 150-million-year-old rocks, experts also discovered a small armoured dinosaur which, in 1980, was given the name *Dracopelta*.

RIB CLUE

The only part of *Dracopelta* that was found was its ribcage, but this was enough for experts to see that it was probably related to another, much bigger, armoured dinosaur called *Sauropelta*. *Dracopelta* was a nodosaur, a member of the ankylosaur family which did not have a tail club for protection.

TEMPTING MEAL

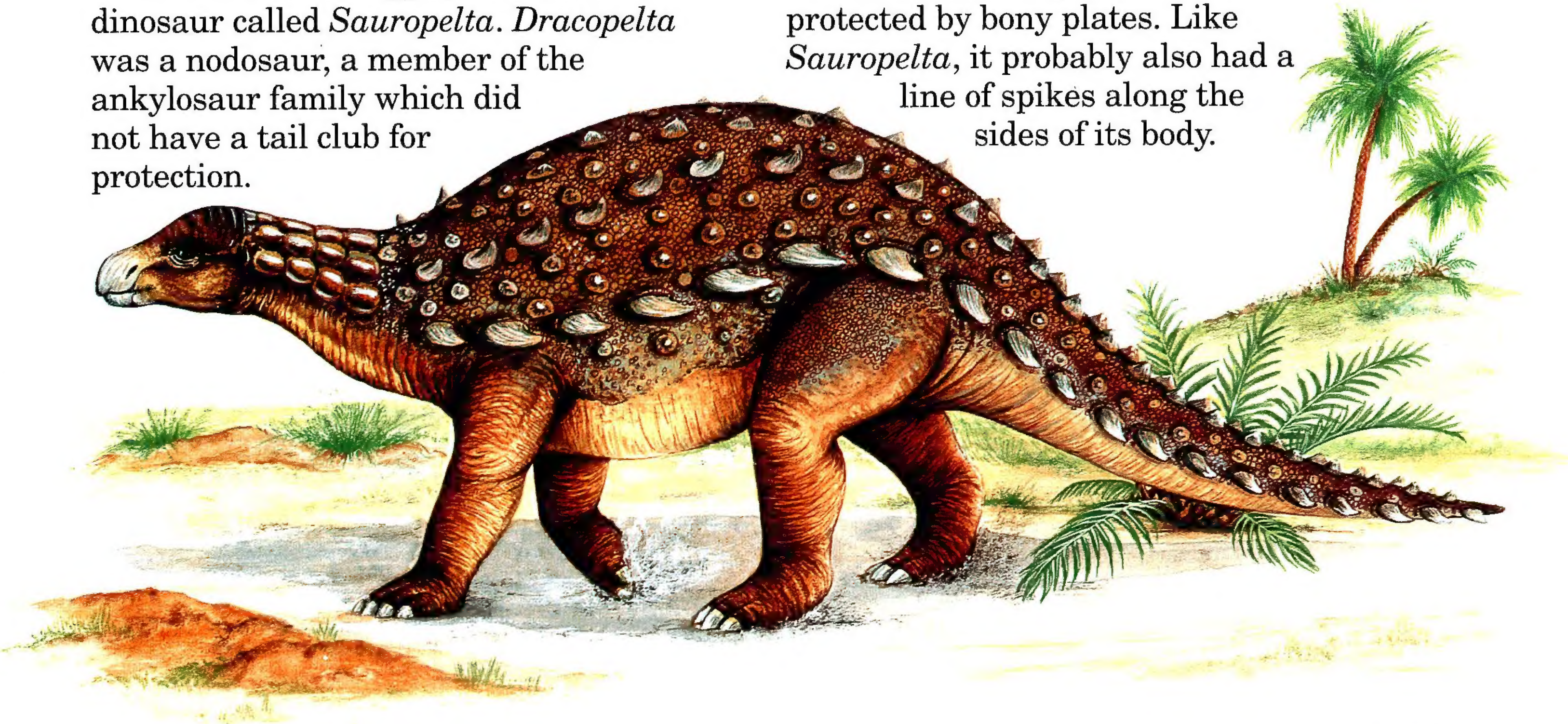
Dracopelta was only as long as a wolf of today, and must have appeared a tempting meal to savage carnosaurs and theropods large and small.

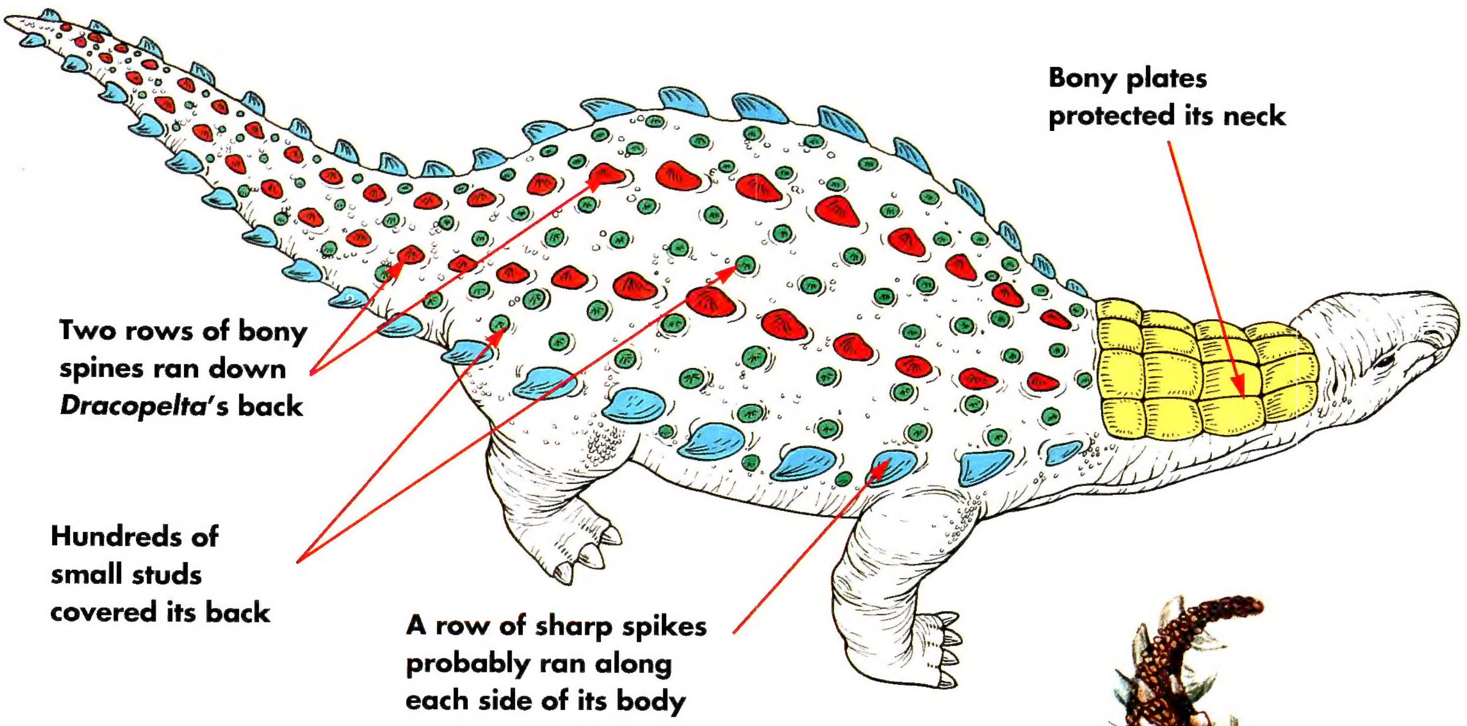
NOT SO SPEEDY

Dracopelta searched for food among low-growing plants and probably dawdled along at a slow pace. Occasionally, *Dracopelta* broke into a trot, but its heavy body and short, stocky legs meant that speedy predators could easily outrun it.

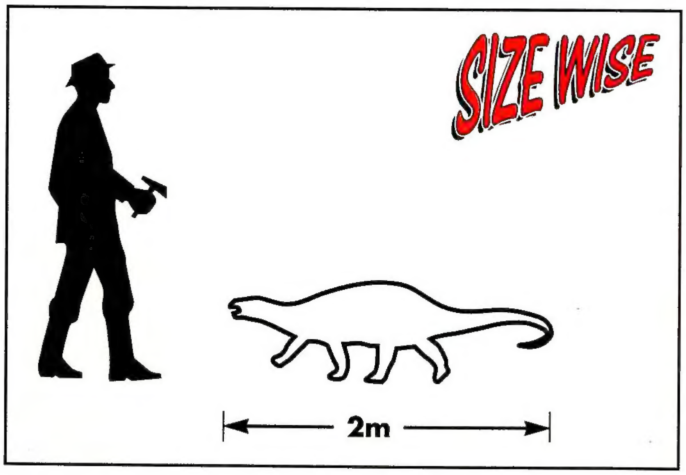
CONES AND STUDS

Dracopelta was built for survival. Its body was like a tank, with several different types of armour plating. Across its back were lines of raised, bony cones which were set among hundreds of smaller studs. The back of *Dracopelta*'s neck was protected by bony plates. Like *Sauropelta*, it probably also had a line of spikes along the sides of its body.



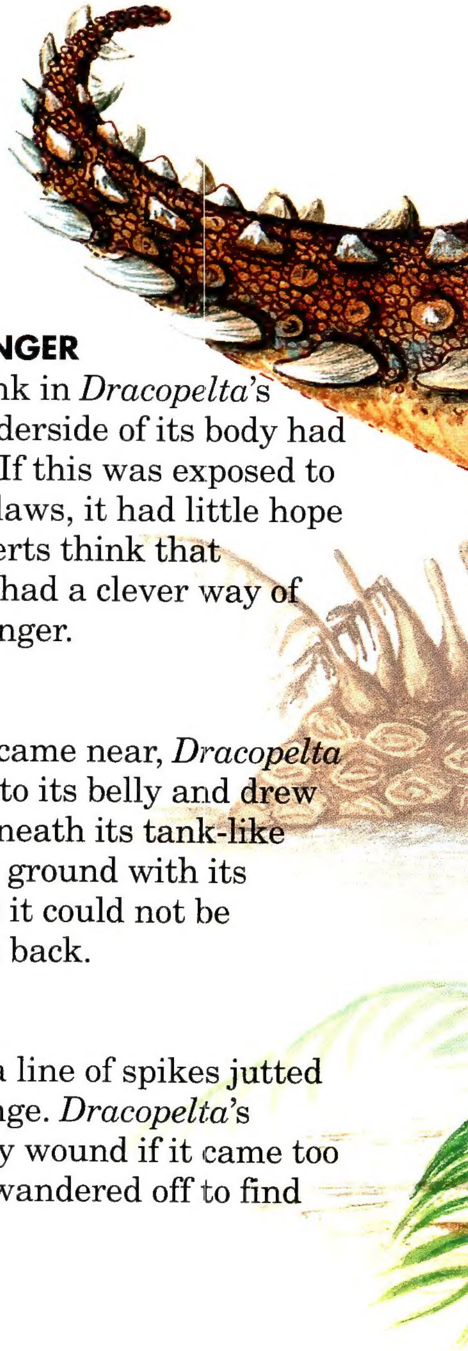

Bony plates protected its neck
Two rows of bony spines ran down *Dracopelta*'s back
Hundreds of small studs covered its back
A row of sharp spikes probably ran along each side of its body

***Dracopelta*'s back was heavily armoured but its soft underbelly was vulnerable to attack.**



MONSTER FACTS

- **NAME:** *Dracopelta* (drak-oh-pel-ta) means 'armoured dragon'
- **GROUP:** dinosaur
- **SIZE:** 2m long
- **FOOD:** plants
- **LIVED:** about 150 million years ago in the Late Jurassic Period in Portugal



DEALING WITH DANGER

But there was a chink in *Dracopelta*'s armour. The soft underside of its body had no protection at all. If this was exposed to a predator's sharp claws, it had little hope of survival. But experts think that nodosaurs probably had a clever way of dealing with this danger.

BELLY FLOP

As a giant predator came near, *Dracopelta* probably flopped on to its belly and drew its arms and legs beneath its tank-like body. It clutched the ground with its stubby claws so that it could not be flipped over on to its back.

SPIKY PROTECTION

All around its body a line of spikes jutted out like a deadly fringe. *Dracopelta*'s enemy risked a nasty wound if it came too near, so it probably wandered off to find an easier victim.

SLABS OF BONE

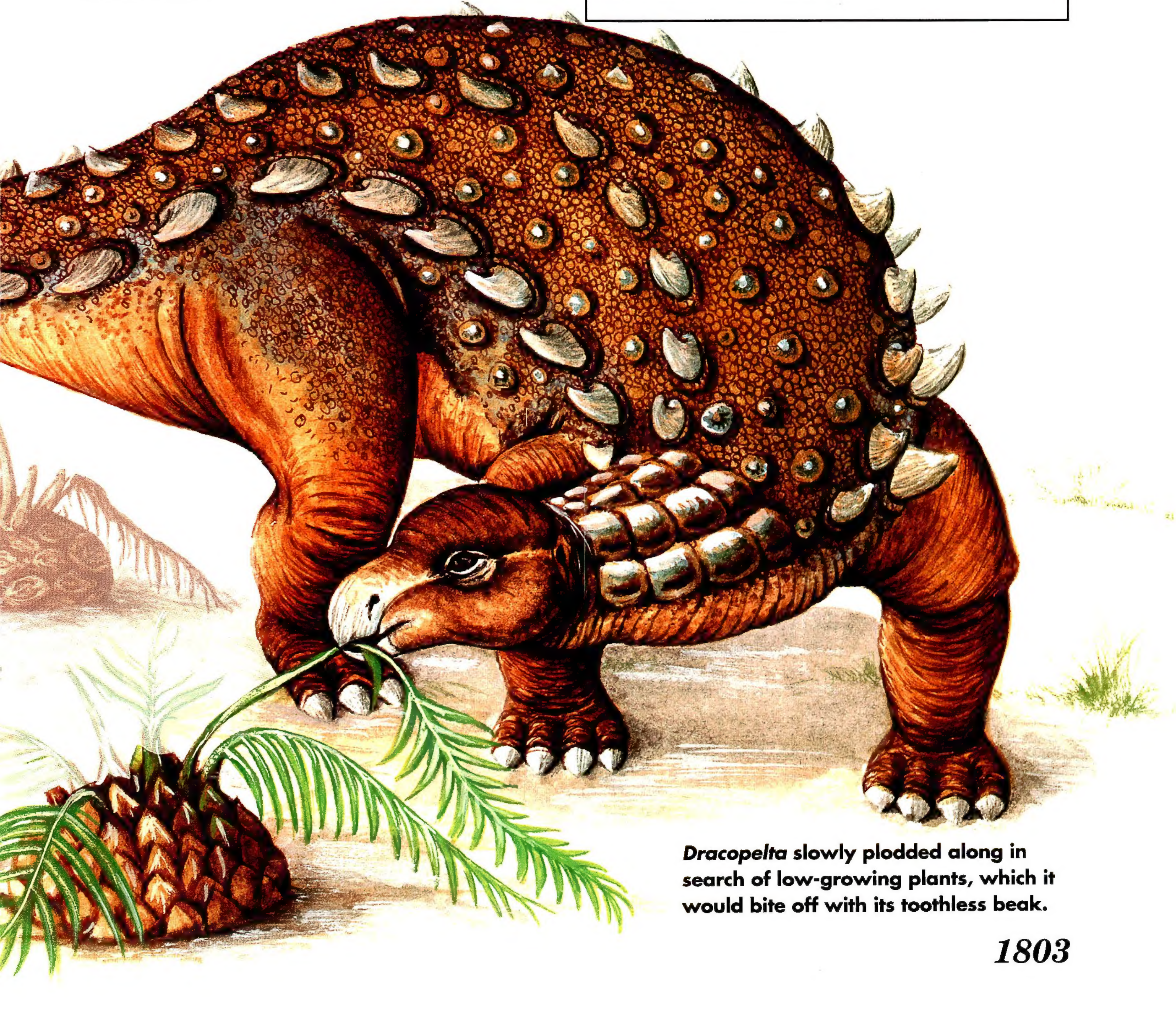
Dracopelta's small head was protected by slabs of bone. It snapped off shoots from low-growing plants with its toothless beak and munched them with its small, grinding teeth.

EASY BREATHER

Like other nodosaurs, *Dracopelta* probably had a bony plate which separated its nasal passages from its mouth. This meant that it was able to breathe and chew at the same time.

Is it true that a nodosaur has been given different names?

Yes. *Struthiosaurus* from Austria and Romania has been known by ten different names. Nodosaurs are not very well known dinosaurs and the original fossils of *Struthiosaurus* were very poor. Every time new ankylosaur fossils were found in southern Europe, a new name was given to them because they could not be properly identified as *Struthiosaurus*. Now experts realise that all these names are wrong and they now plan to re-describe *Struthiosaurus*.



Dracopelta **slowly plodded along in search of low-growing plants, which it would bite off with its toothless beak.**

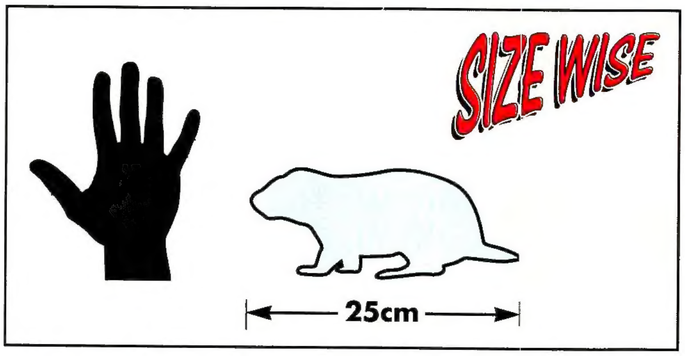
PALAEOCASTOR

***Palaeocastor* was an early beaver with amazing burrowing skills.**

Geologists were puzzled for many years by strange, spiral holes discovered in fossil soils in Nebraska, USA. These ran up to 2.5m into the ground. The mystery was solved when experts discovered that a tiny prehistoric beaver, *Palaeocastor*, had made these passages to its underground home.

SCRATCH MATCH

Palaeocastor had burrowed through the soil using its long front teeth. Experts were able to match the marks they found with the shape of *Palaeocastor*'s teeth. This extraordinary little mammal could dig a burrow that was ten times its own length. It knew how to build itself a comfortable home, just like the dam-building beaver of today.

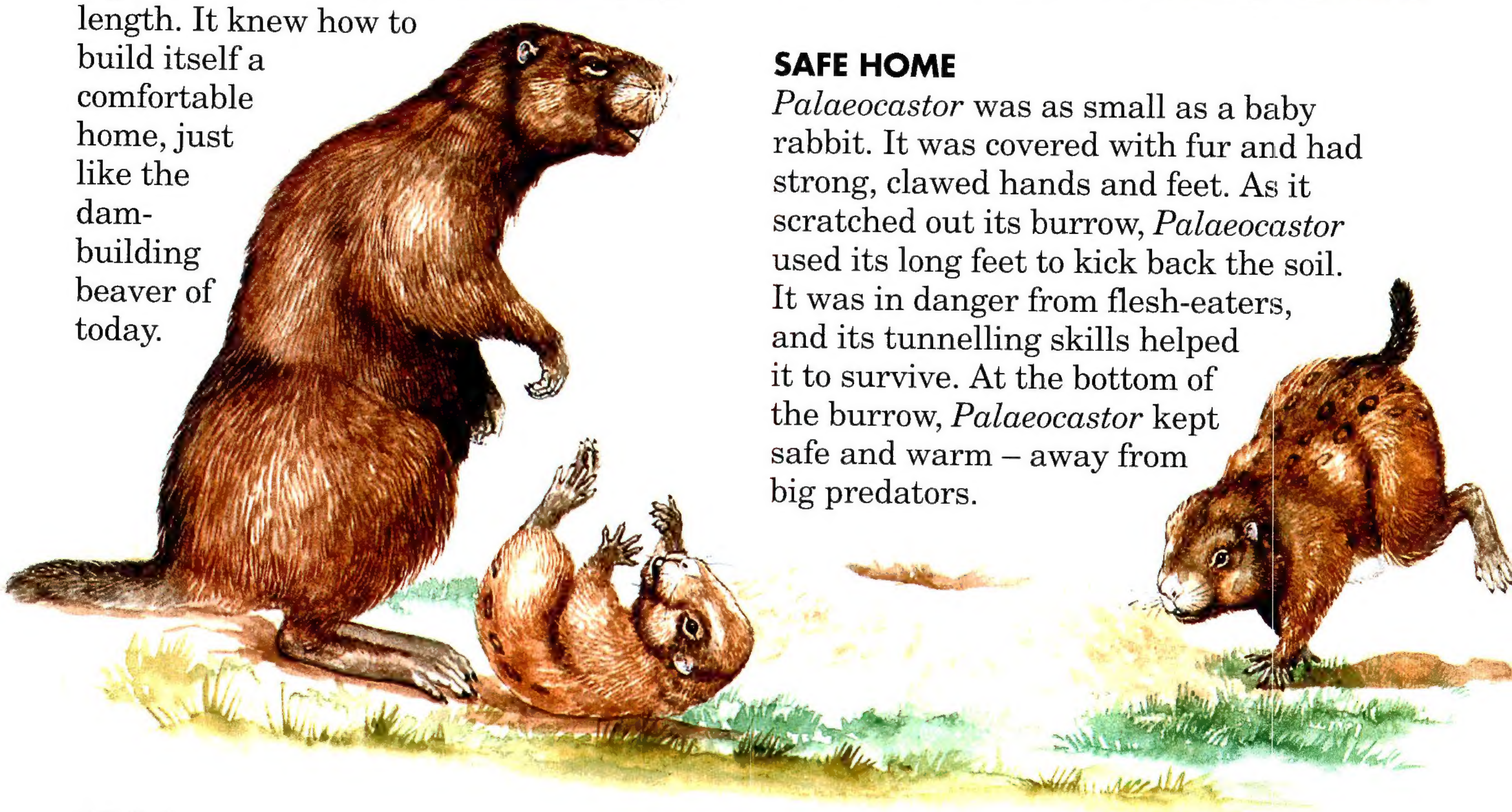


MONSTER FACTS

- **NAME:** *Palaeocastor* (pal-ee-o-kas-tor) means 'ancient beaver'
- **GROUP:** mammal
- **SIZE:** 25cm long
- **FOOD:** plants
- **LIVED:** about 30 million years ago in the Oligocene and Miocene Epochs

SAFE HOME

Palaeocastor was as small as a baby rabbit. It was covered with fur and had strong, clawed hands and feet. As it scratched out its burrow, *Palaeocastor* used its long feet to kick back the soil. It was in danger from flesh-eaters, and its tunnelling skills helped it to survive. At the bottom of the burrow, *Palaeocastor* kept safe and warm – away from big predators.



WANNANOSAURUS

Little *Wannanosaurus* was one of the smallest of all the dinosaurs.

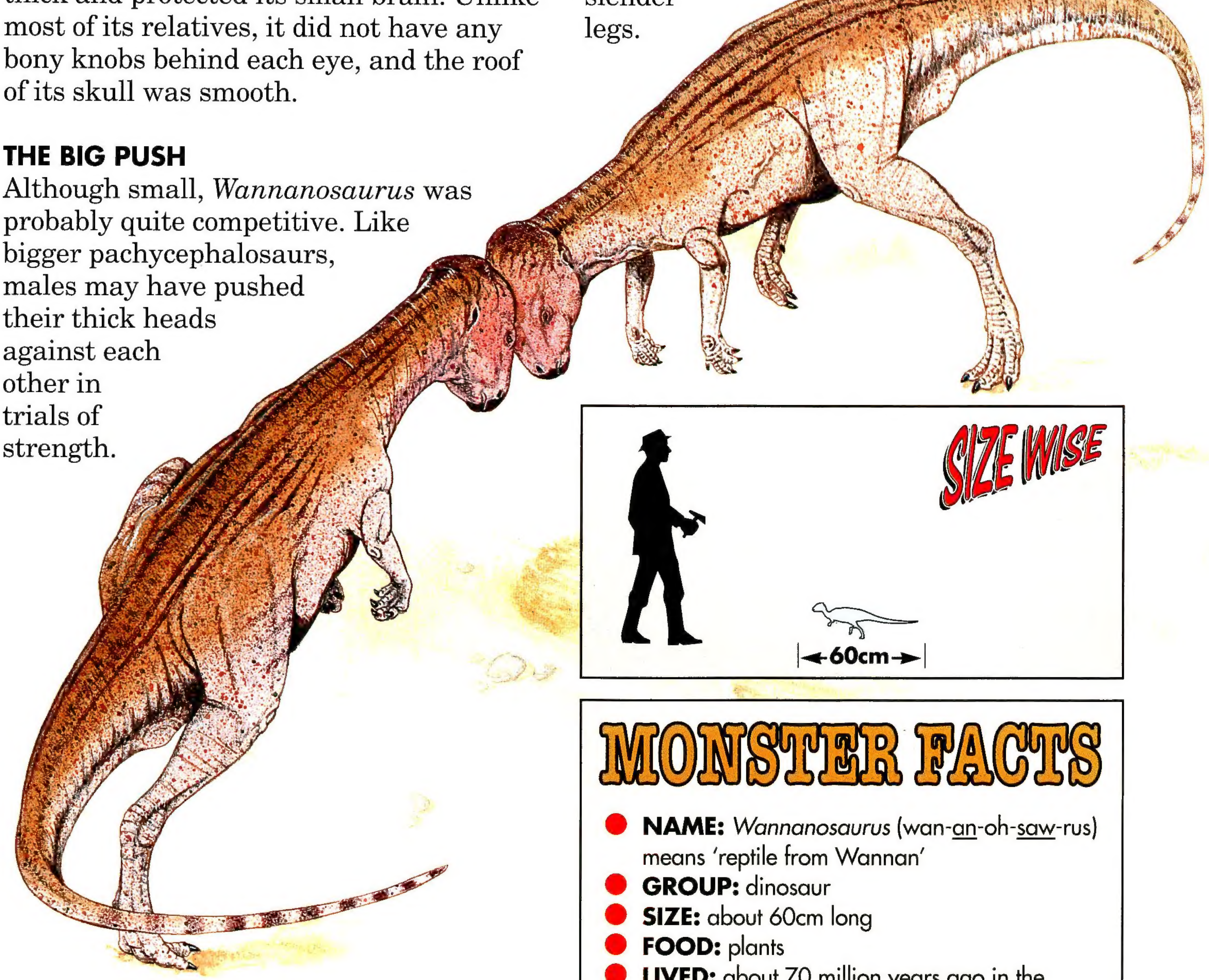
About as big as a chicken, *Wannanosaurus* was a bone-headed dinosaur. Its skull was thick and protected its small brain. Unlike most of its relatives, it did not have any bony knobs behind each eye, and the roof of its skull was smooth.

THE BIG PUSH

Although small, *Wannanosaurus* was probably quite competitive. Like bigger pachycephalosaurs, males may have pushed their thick heads against each other in trials of strength.

TAIL UP AND RUNNING

Peace-loving *Wannanosaurus* browsed on low-growing plants and shredded up leaves with the curved, jagged edges of its tiny teeth. If disturbed, it would put its head down, its tail up and scuttle away on two strong, slender legs.



SIZE WISE

MONSTER FACTS

- **NAME:** *Wannanosaurus* (wan-an-oh-saw-rus) means 'reptile from Wannan'
- **GROUP:** dinosaur
- **SIZE:** about 60cm long
- **FOOD:** plants
- **LIVED:** about 70 million years ago in the Late Cretaceous Period in China

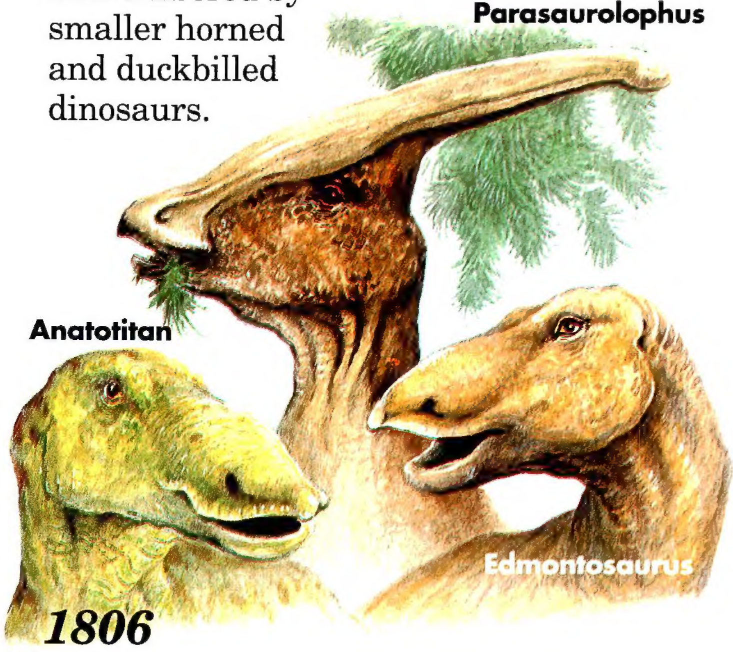
The very last dinosaurs

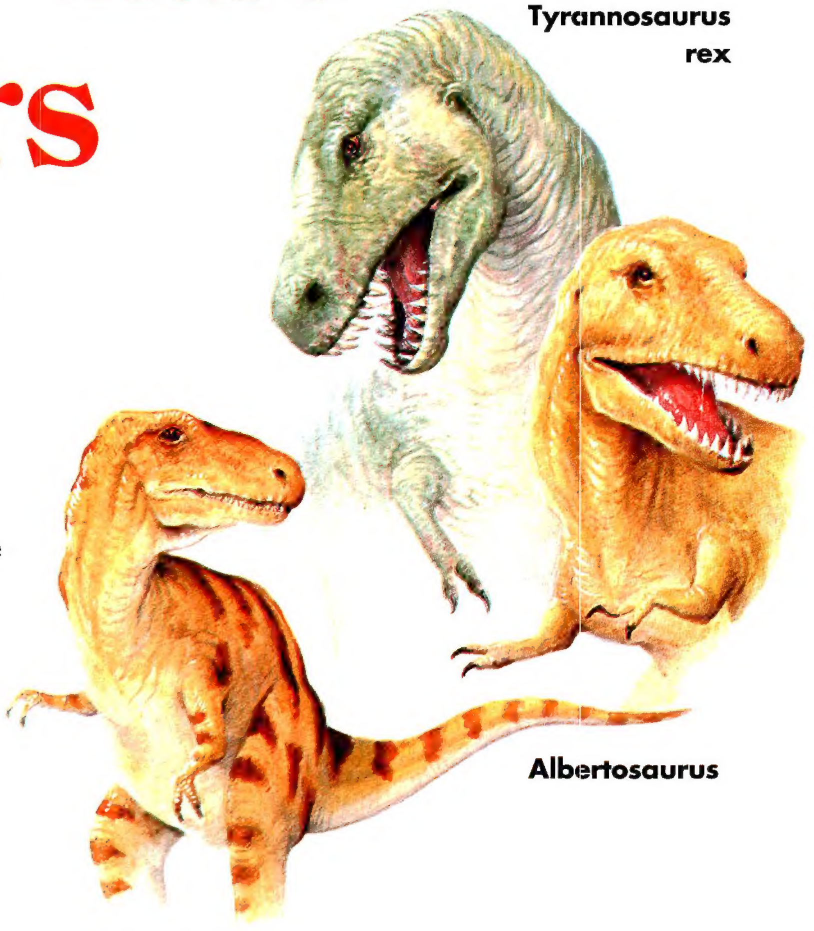
Which dinosaurs were left at the very end of the Age of Dinosaurs?

During the last part of the Age of the Dinosaurs the world gradually changed. Mountains appeared and shallow seas began to divide up the land. Earlier, during the Jurassic Period, dinosaurs roamed over most of the world. But, as the continents drifted apart, different groups of dinosaurs were left on different continents.

END OF THE CRETACEOUS

By the end of the Cretaceous Period, changes had taken place in the world of the dinosaurs: huge carnivores had met their match in tank-like plant-eaters; toothless bird-like dinosaurs had appeared; large sauropods were outnumbered by smaller horned and duckbilled dinosaurs.





NORTH AMERICAN TERRORS

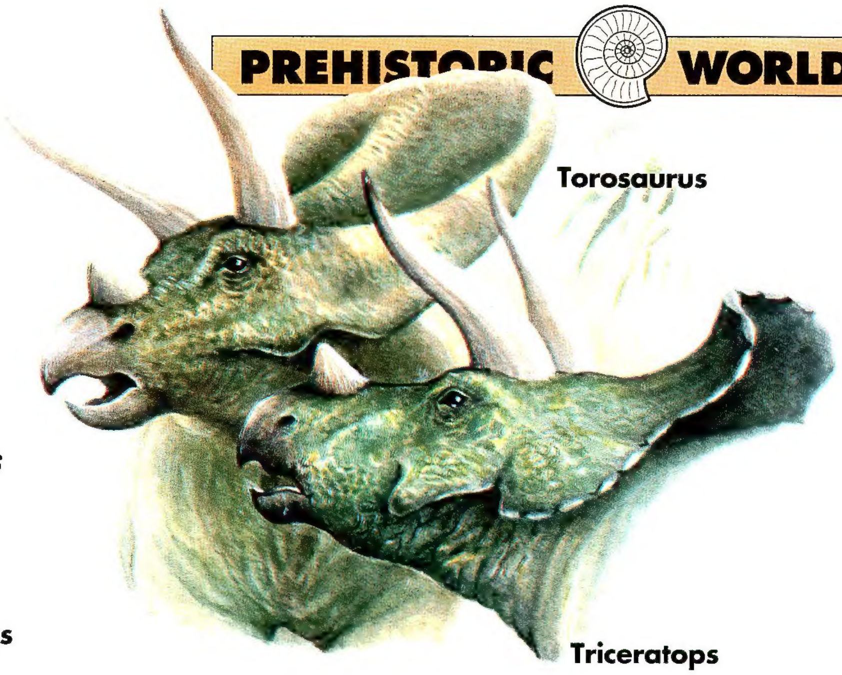
The most famous of all the meat-eaters, the great *Tyrannosaurus rex* terrorised its peaceful North American neighbours during the Cretaceous Period. It was not the only fearsome predator. *Nanotyrannus* and *Albertosaurus*, smaller relatives of *T rex*, prowled the plains too.

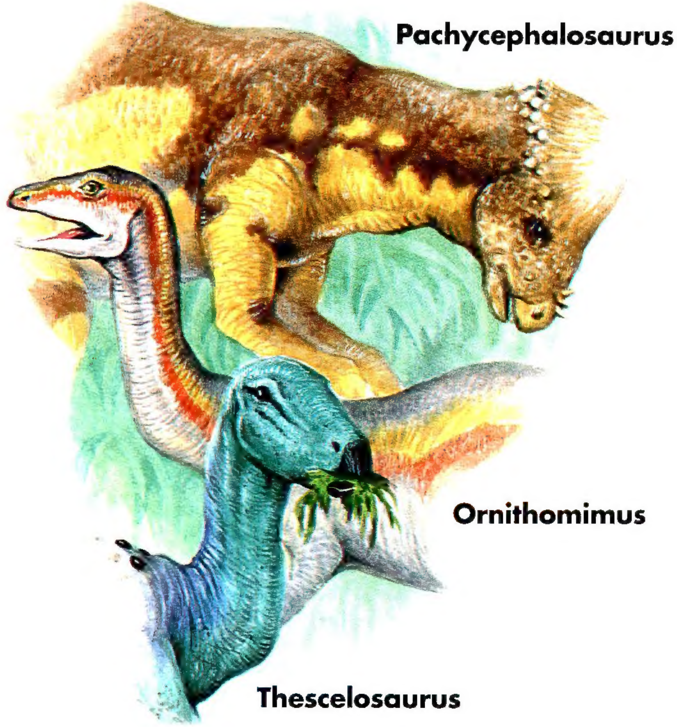
NOISY NIGHTS

The duckbills *Anatotitan* and *Edmontosaurus* lived on swampy lowland plains near large, twisting rivers. The quiet of the Late Cretaceous evening was probably shattered by the bellowing noise of these hadrosaurs calling to each other across the plains.

HEADS ABOVE THE REST

Triceratops, the last of the short-frilled ceratopid dinosaurs, lived in North America, too. It lived beside long-frilled *Torosaurus*. Another survivor with an amazing head, *Parasaurolophus*, had a crest that grew to be as long as a tall human. Bone-headed *Pachycephalosaurus* had a smaller, but immensely thick skull to protect its tiny brain.





IT'S A FACT

NORTH AMERICAN VARIETY

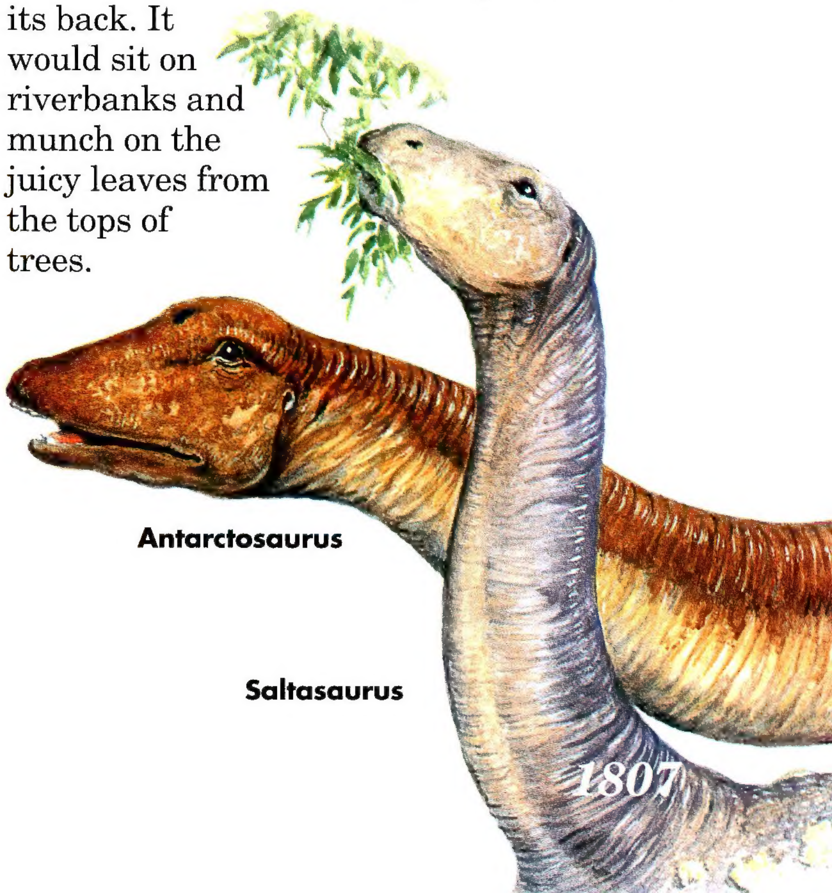
The greatest variety of dinosaurs lived in North America at the end of the Age of Dinosaurs. There were predators, duckbills, horned and frilled dinosaurs, small dinosaurs such as *Thescelosaurus,* and ostrich dinosaurs such as *Ornithomimus.*

CONSTANT THREAT

The lives of these dinosaurs were fraught with danger. All around them volcanoes were a constant threat. Huge graveyards of dinosaurs, such as *Hypacrosaurus,* show that thousands were killed in one go when volcanoes erupted and spewed poisonous gases and burning ash into the air.

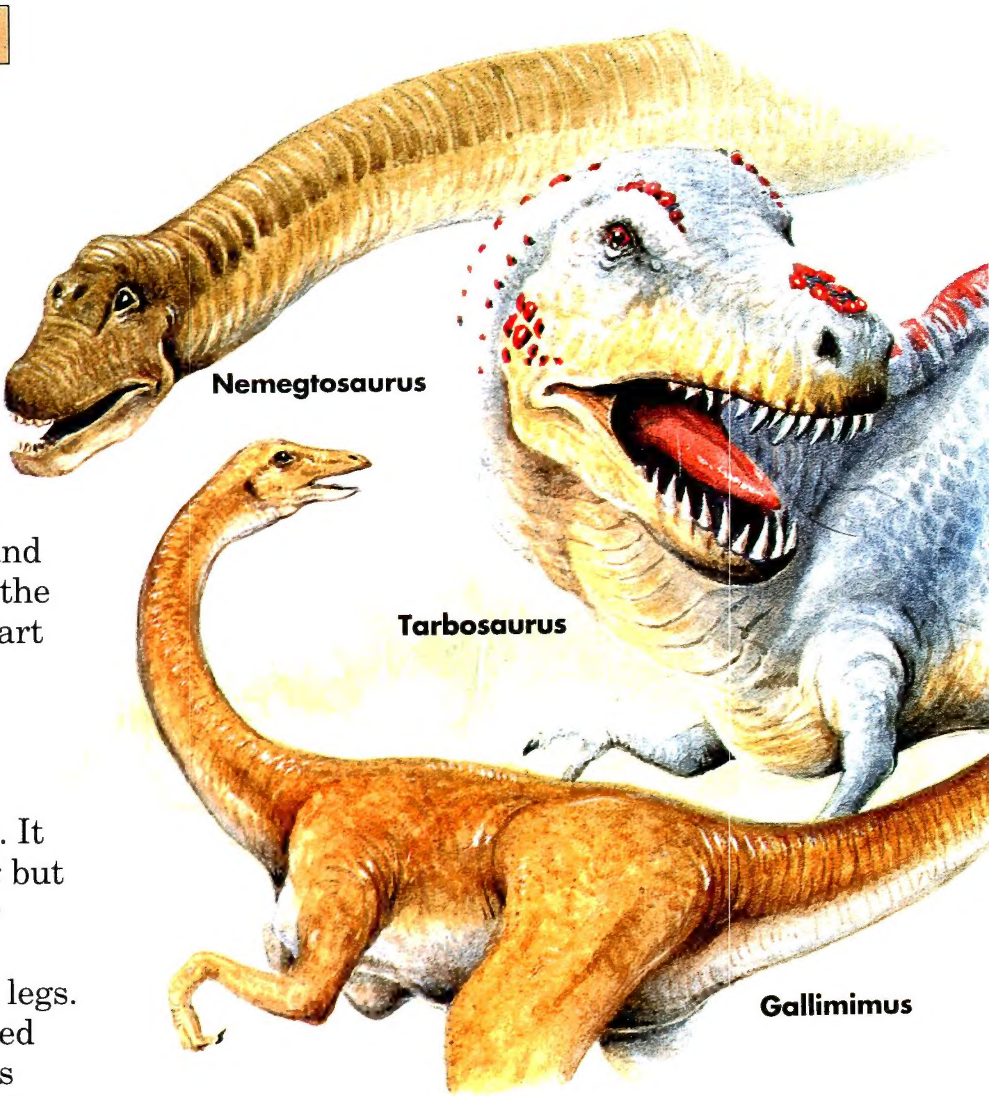
SURPRISING SOUTH AMERICA

The fossils of *Antarctosaurus* and *Saltasaurus*, two of the very last sauropods, were found in Argentina. *Saltasaurus* had unusual, bony armour on its back. It would sit on riverbanks and munch on the juicy leaves from the tops of trees.



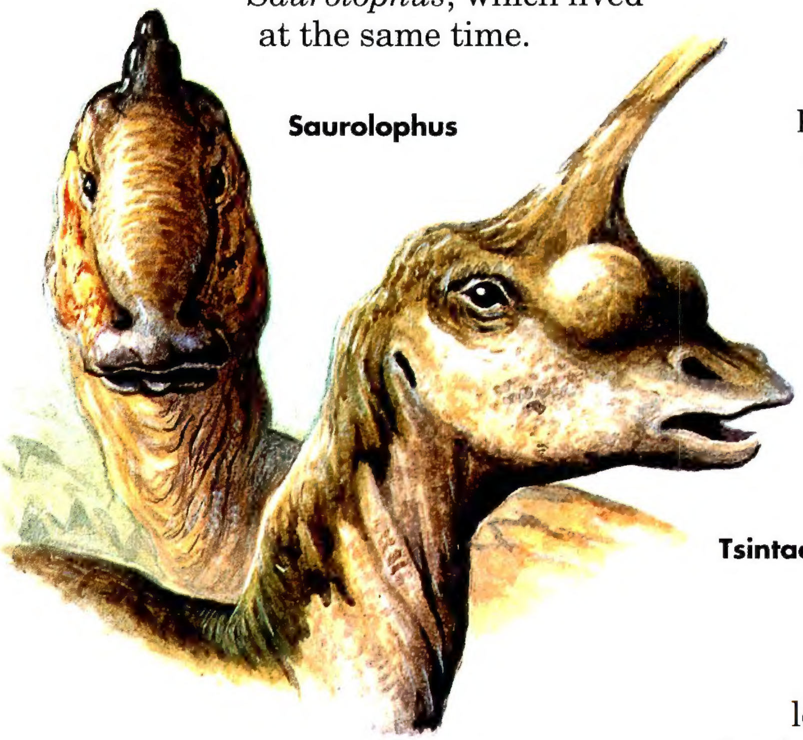
A HARD LIFE IN ASIA

The last dinosaurs to live in China and Mongolia had a harsher life than their North American relatives. They lived in dry lowlands surrounded by high mountains. At any moment, a flash flood crashing down from the mountains might drown a whole herd of dinosaurs. Desert sandstorms and sliding sand dunes were yet more dangers for the last surviving dinosaurs in this part of the world.



LAST ASIAN PREDATOR

Tarbosaurus was one of the last predators in China and Mongolia. It was related to *Tyrannosaurus rex* but it had a larger head and a lighter body. Meat-eating *Tarbosaurus* thundered along on two powerful legs. It probably ambushed hadrosaurs such as *Tsintaosaurus* and *Saurolophus*, which lived at the same time.

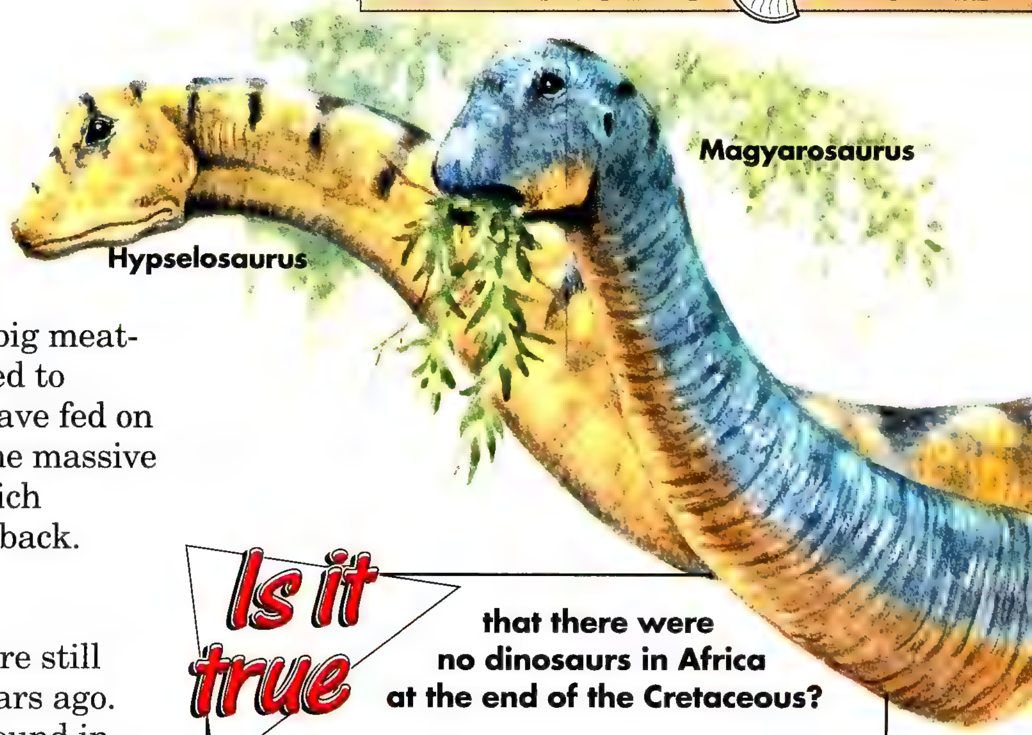


GOOD SURVIVOR

Another of *Tarbosaurus*' possible victims, lumbering *Nemegtosaurus*, may have been the only diplodocid to survive until the end of the Age of the Dinosaurs.

FAST RUNNER

Tarbosaurus would have found the ornithomimosaur, *Gallimimus,* harder to catch than slow-moving *Nemegtosaurus*. *Gallimimus* ran fast on long, slender legs, and watched for danger with sharp eyes.



ISLAND INDIA

By the end of the Cretaceous, India had separated from Africa and drifted away as an island. The 'Indian crocodile', *Indosuchus,* was a big meat-eating dinosaur that managed to survive to the end. It may have fed on tiny *Jubbulpuria,* or even the massive sauropod *Titanosaurus*, which probably had an armoured back.

STILL JOINED TOGETHER

Antarctica and Australia were still joined together 65 million years ago. Most of the dinosaur fossils found in Australia date from Early Cretaceous times. But recent discoveries in Antarctica of an ankylosaur and a hypsolophodontid may show that some dinosaurs existed later in this part of the world.

Is it true that there were no dinosaurs in Africa at the end of the Cretaceous?

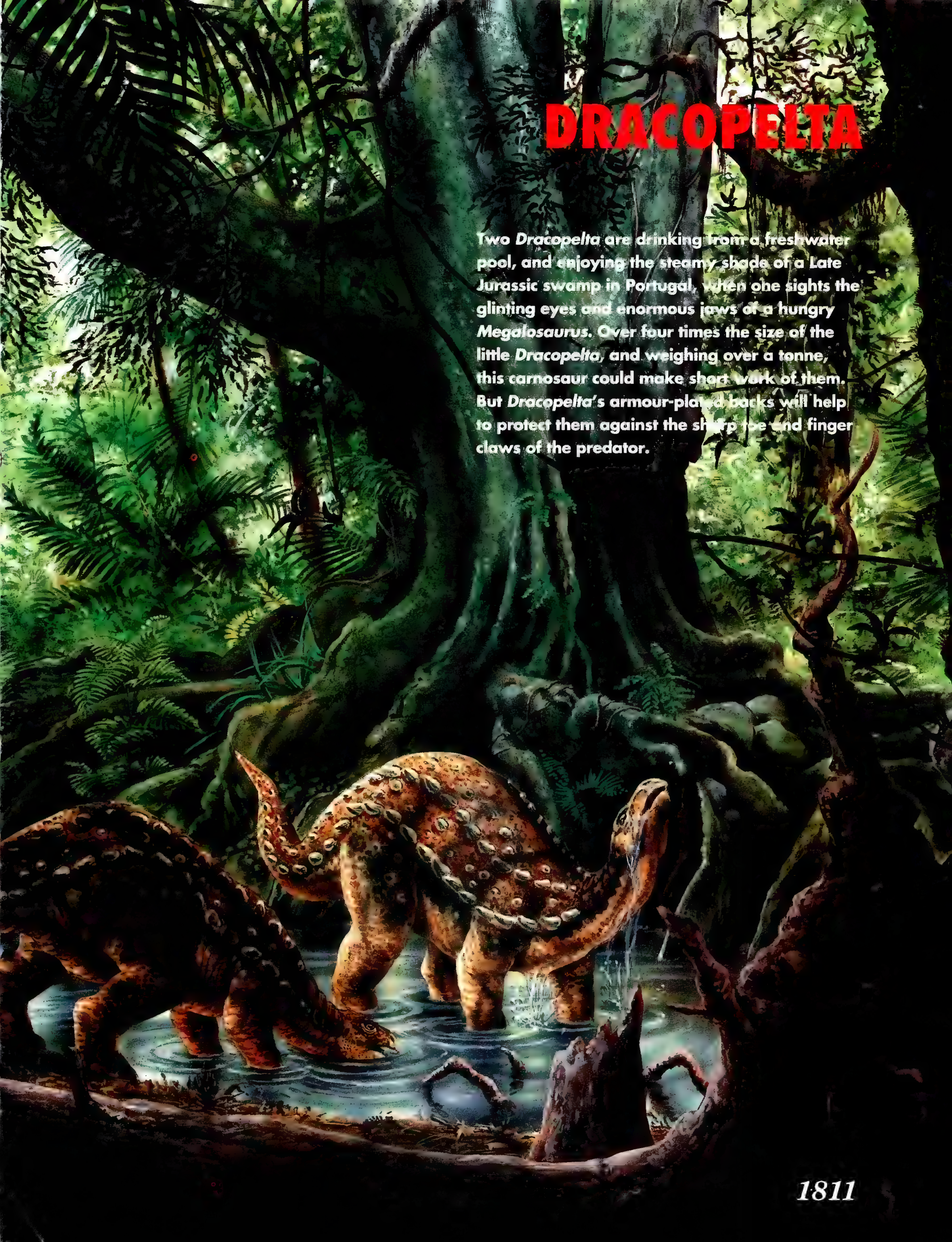
Experts are not sure yet. There is little evidence to show that dinosaurs were still living in Africa 66 million years ago. Most of the fossils found so far date from Jurassic and Early Cretaceous times. However, it is possible that *Kangnasaurus* and sail-backed *Spinosaurus* survived to the end.

EUROPEAN SURVIVORS

Dinosaurs left in Europe at the end of the Cretaceous lived on a chain of islands that stretched from Spain, through southern France, and up towards Austria and Romania. The sauropod *Hypselosaurus* laid its huge eggs in France and Spain. Its relative, *Titanosaurus,* survived in Europe as well as in India and South America. *Magyarosaurus*, another sauropod, lived in Romania.

GIANTS OF THE PAST

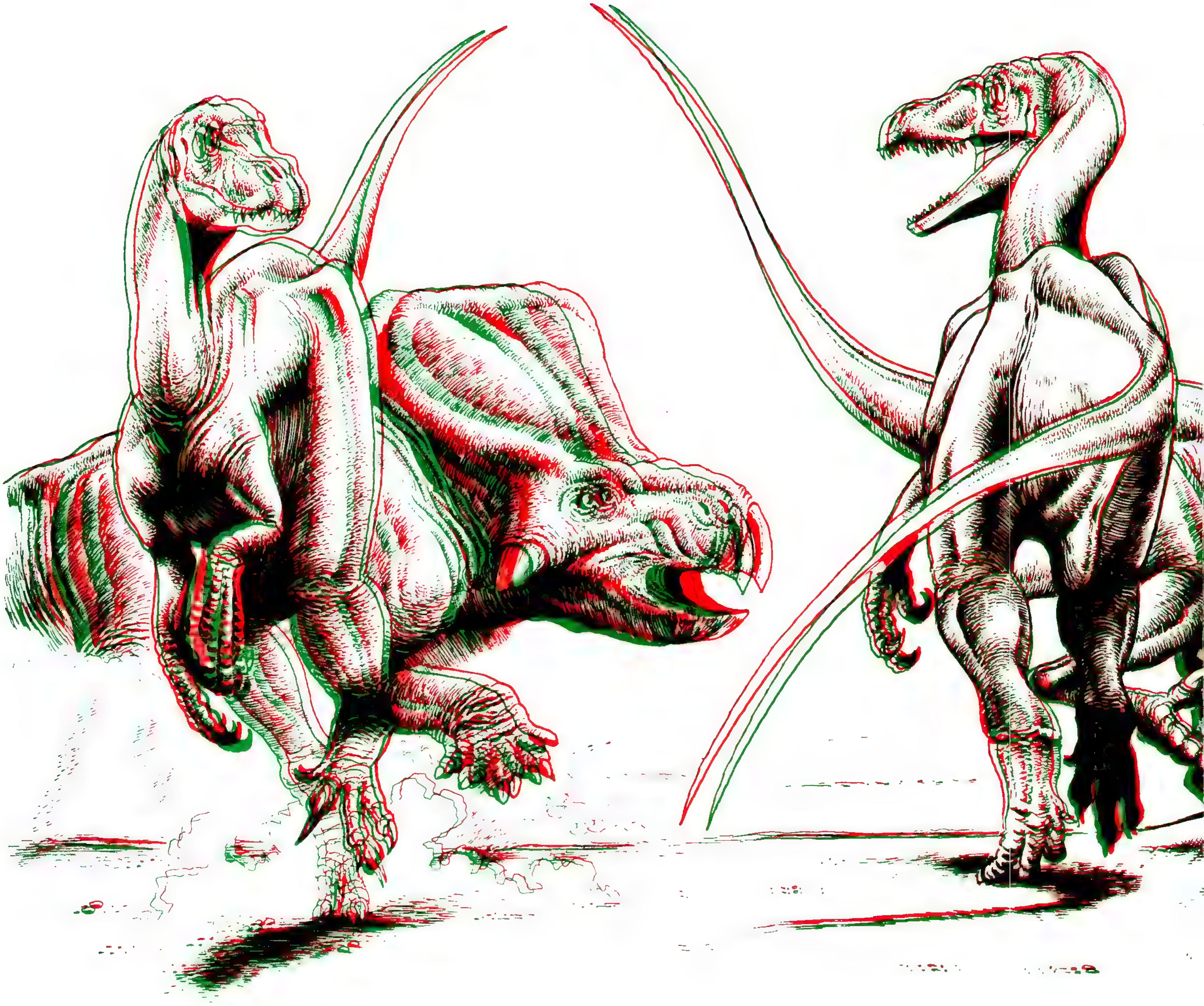
DRACOPELTA



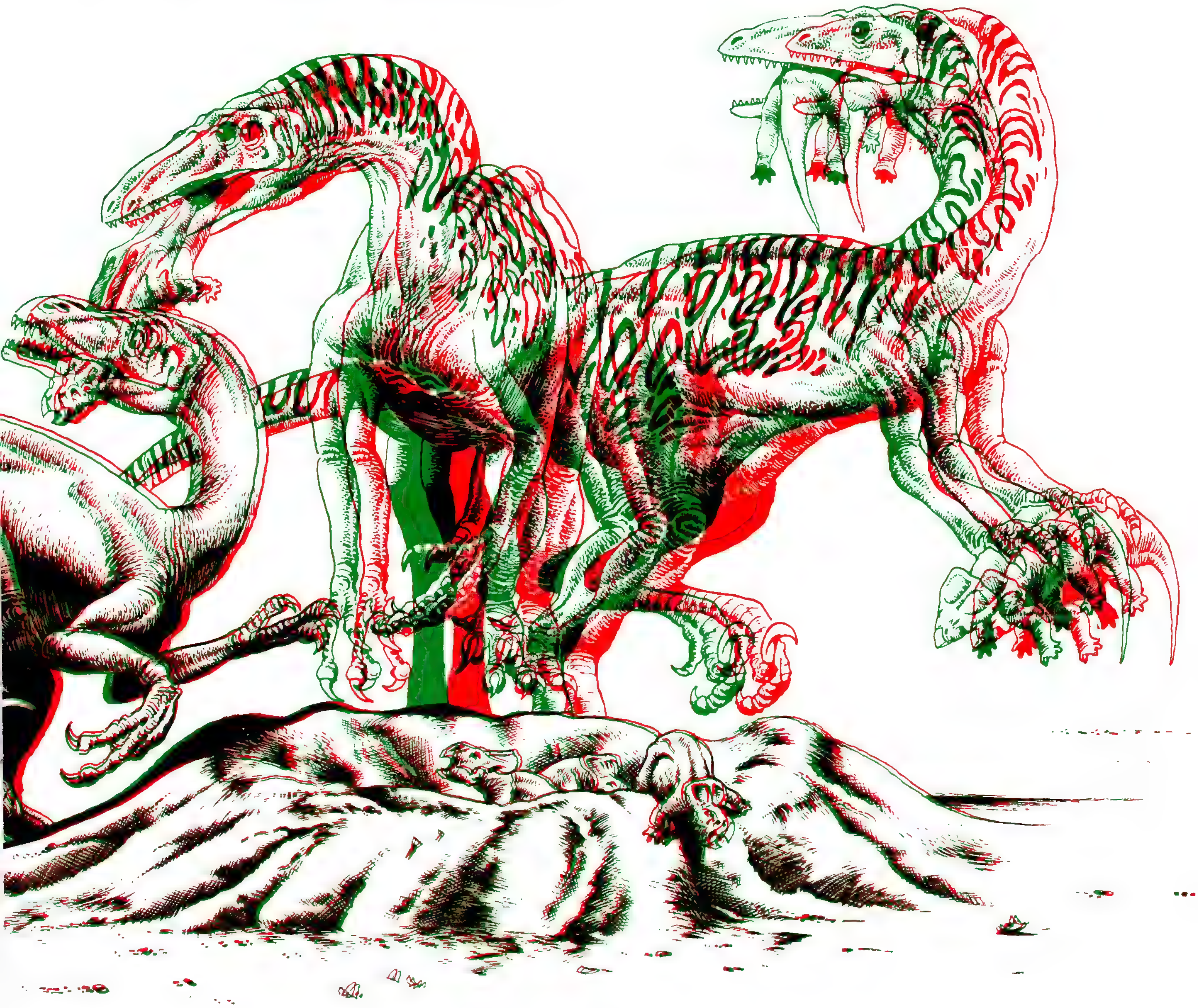
Two *Dracopelta* are drinking from a freshwater pool, and enjoying the steamy shade of a Late Jurassic swamp in Portugal, when one sights the glinting eyes and enormous jaws of a hungry *Megalosaurus*. Over four times the size of the little *Dracopelta*, and weighing over a tonne, this carnosaur could make short work of them. But *Dracopelta*'s armour-plated backs will help to protect them against the sharp toe and finger claws of the predator.

3-D Gallery 85

SAURORNITHOIDES



In Late Cretaceous Mongolia, two *Velociraptor* and a group of *Saurornithoides* attack an unprotected nest of *Protoceratops* young, squabbling over who will take away the easy pickings. The mother rushes to the defence of her young, but she will be no match for the five vicious predators.



Cold comfort

In the bitter cold of the Ice Age some animals took to living in caves.

Imagine the Ice Age. Think of the chill winds blasting down the valleys and the biting blizzards whistling through the glaciers. Think of being chilled right to the bone.

COSY CAVE

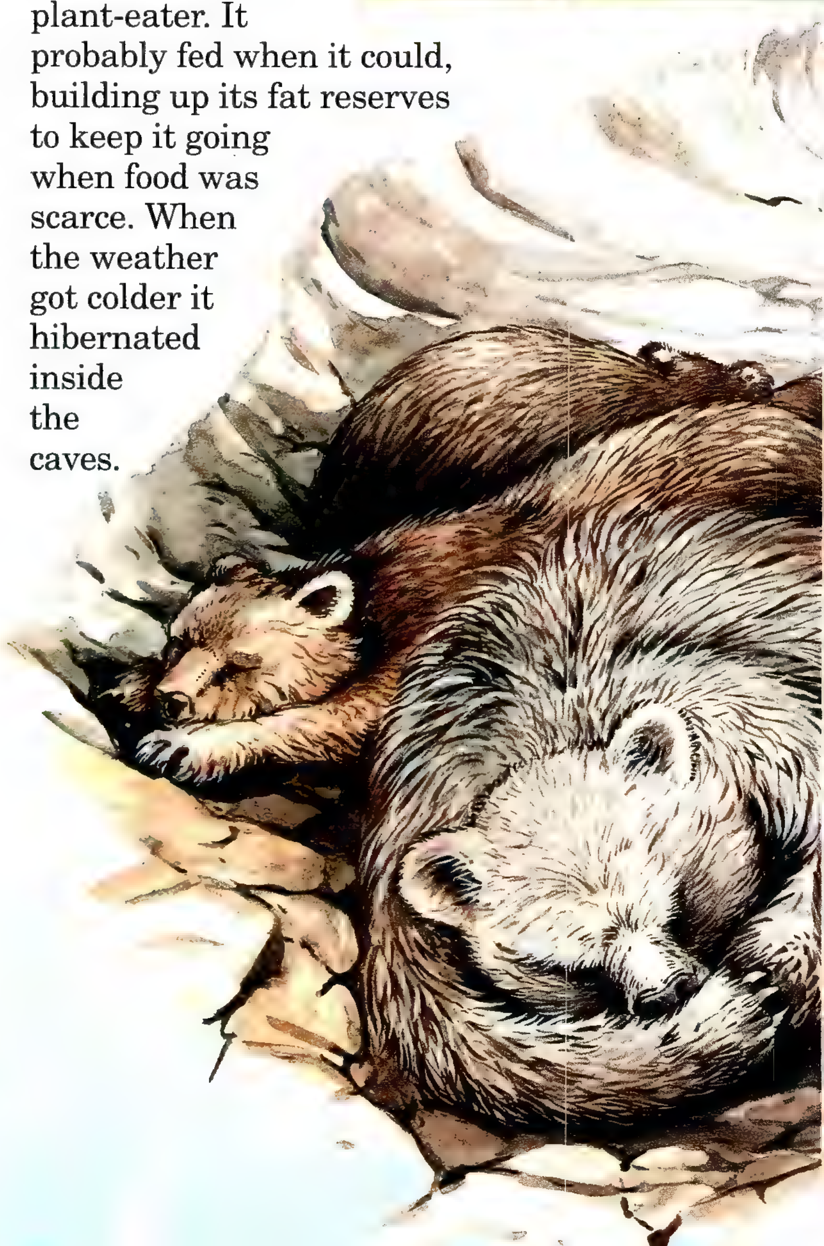
Now think of a cosy mountainside cave, away from the howling winter winds. Here, you can huddle together with your friends and family and build up a fug of body heat and warm breath. It is little wonder that many Ice-Age animals lived in caves.

DISCOVERY OF BONES

We know they lived in caves because scientists have discovered the bones of several different animals on the floors of caves, especially in Europe.

GREAT BEAR

The great cave bear lived during the Pleistocene Ice Age, which ended about 10,000 years ago, and was about one and a half times the size of today's brown bear. The cave bear was a plant-eater. It probably fed when it could, building up its fat reserves to keep it going when food was scarce. When the weather got colder it hibernated inside the caves.



IT'S A FACT

CAVE APE

Bears and lions were not the only animals that lived in caves. *Gigantopithecus* was a giant ape, which stood about 3m high. Its fossils have been found in caves in China. It lived about one million years ago.

CAVE BEAR CLAN

Many cave bears hibernated together in one cave. Some died during their winter sleep. There was one cave in Austria which contained the remains of over 30,000 cave bears. The bears did not all die at the same time – the cave was the refuge of cave bears for hundreds of years, and the bones built up over the centuries.

Since the Ice Age, caves have provided shelter for many animals, including lions, bears and bats.

This man is looking for the nests of some cave-dwelling birds.

LITTLE BEAR

The fossils of smaller bears have been found in the Harz Mountains of Germany. These bears lived very high up where food was probably scarce. The bears were small because a smaller body needed less food than a large one.

CAVE RELATIVE

Other animals lived in Ice-Age caves. The cave lion was a very close relative of today's lion – they may even be the same species. The cave lion lived in caves in Europe. It was the biggest biting cat that ever lived, far bigger than today's lion.

LONDON LIONS

The fossils of cave lions have been found where Trafalgar Square now stands in London. They probably lived in caves in the surrounding hills, but came down to drink from and hunt near the River Thames.

time detective

How do you become a palaeontologist? We talk to our expert, Dr David Norman.

David Norman has been involved in many important recent dinosaur finds. He is an expert on *Iguanodon*. We asked him how he became interested in palaeontology, and what it's like to be a dinosaur detective.

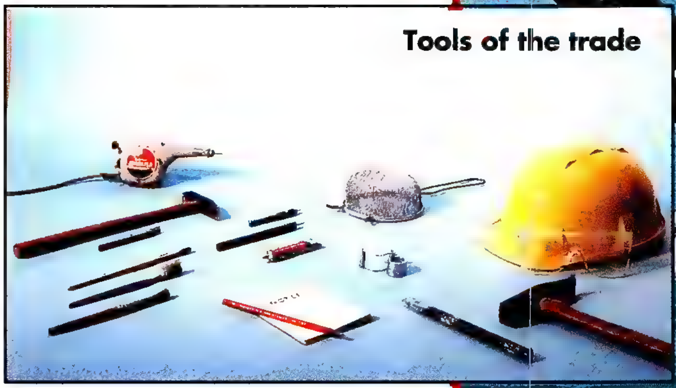
Q HOW DID YOU BECOME INTERESTED IN FOSSILS?

'When I was 11 or 12, I began looking for fossils along the ledges of Kimmeridge Bay in Dorset, England. The first I found were ammonites. I got interested in fossils again when I was at university studying microbiology and zoology. I did a project on how very early mammals used their jaws, and I studied tiny fossil teeth. After three years at university, I began a research project on dinosaurs. And that was when my interest in dinosaurs really started.'

IT'S A FACT

DOWN TO EARTH

The best fossil hunters take their time. Get down on your hands and knees and look carefully at each spot you are interested in. Then you may find a valuable clue.



Tools of the trade

Q WHAT QUALITIES DO YOU NEED TO BE A GOOD PALAEONTOLOGIST?

'You need to be very determined. And you must be able to ask "why?" all the time. You mustn't take anything for granted. Working on fossils can take a very long time, so you must be patient. You can miss things easily if you are impatient. Another important quality is having an extremely good eye for detail.'

WHAT QUALIFICATIONS DO YOU NEED TO BECOME A PALAEONTOLOGIST?

'The best way to get started is to be good at sciences. If you're good at these subjects at school, this will give you the chance to go to university to study biology, zoology or geology. It's best to combine these sciences. That way, you'll understand animals as well as the rocks where they are found. A good palaeontologist needs to understand and be interested in lots of different branches of science.'

HOW CAN YOU JOIN A DIG?

'You can become a member of a local geological group. There are often groups attached to local museums or natural history societies, which go out looking for fossils.'

WHAT WAS YOUR MOST EXCITING DIG?

'Finding the remains of the first armoured dinosaur in Australia. The discovery was something completely new to science.'

WAS IT A DIFFICULT DIG?

'It was a long one – three months on the edge of the Simpson Desert in Queensland. So it was hot during the day and freezing at night. And it was frustrating because we didn't find a great deal. There was a big dinosaur footprint trackway, showing there had been lots of dinosaurs there. But we didn't find many bones.'

Collecting fossils at Compton Bay on the Isle of Wight.

Good fossil hunting

Searching for fossils takes time and patience. You need to follow the rules and know where to look.

Finding a dinosaur fossil is rare. So don't expect to discover a new giant of the past on your first fossil-hunting expedition. Your first find is much more likely to be a fossil shell. It takes time to train your eye to spot the rarer fossil bones.

RIGHT ROCKS

Dinosaurs became fossilized in the first place by being buried in sand or mud. So they are only found in the right kinds of rock such as sandstone, shales or clays. They will also only be found in rocks from the Mesozoic Period.

EAGLE EYE

Many people search for fossils by walking along the bottom of cliffs or in valleys, where rocks of the right age have been exposed. They look for bits of fossilized bone. Hunting like this needs a lot of patience and an expert eye. Days can go past without finding anything. Often this is because it takes a while to be able to recognise the signs of a fossil fragment.

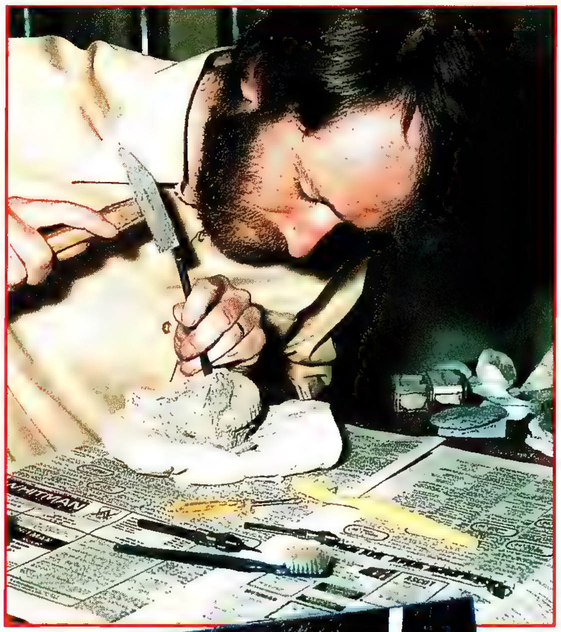
After a dig, there's still much work to be done back at the lab. This dig, at Ockley in Surrey, unearthed the dinosaur *Baryonyx walkeri*.

MARKING THE SPOT

Get a good geological map that shows the different types of rock. You can then find rocks of the right age. You can also contact local people to see if they know anything.

BEWARE!

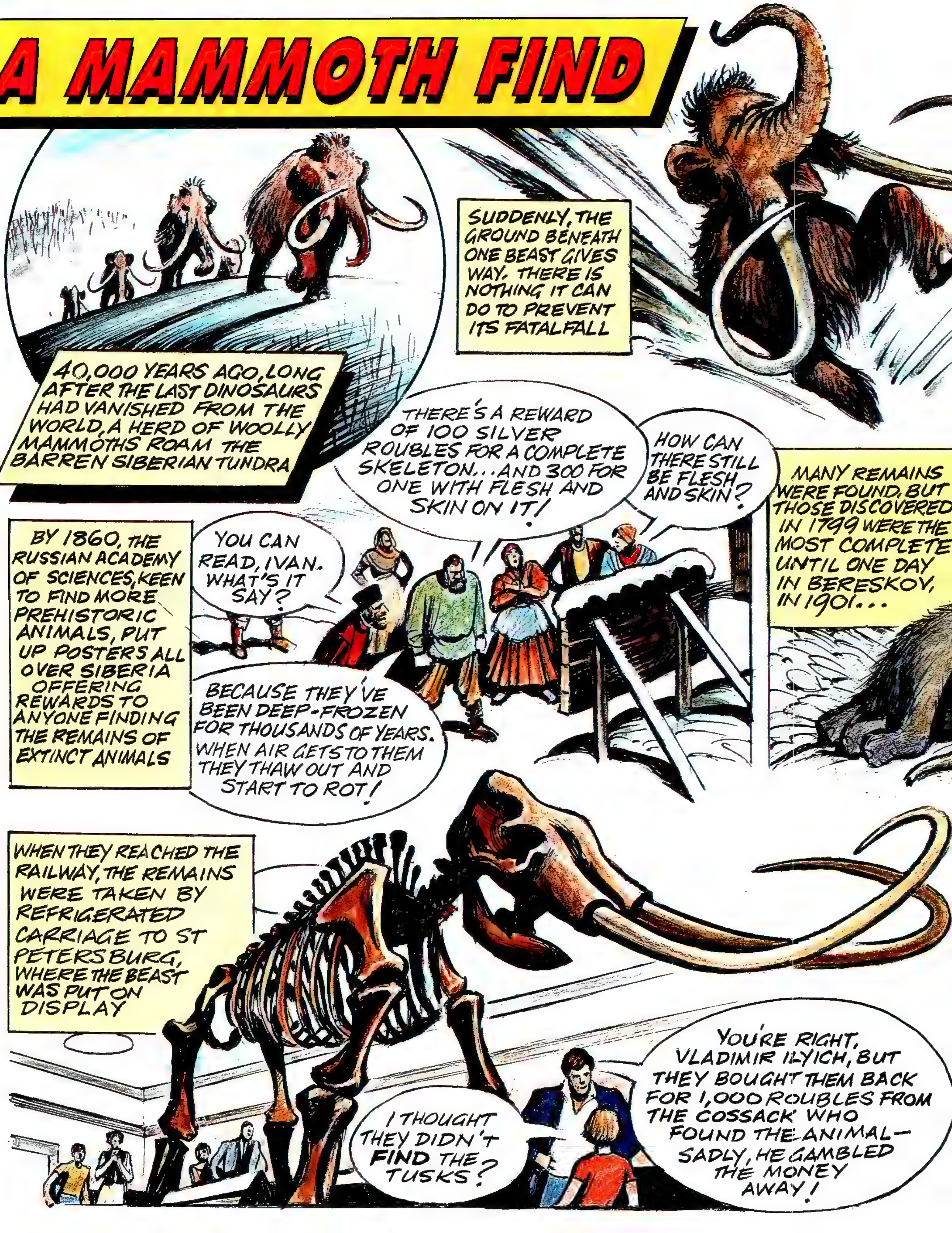
Fossils are often found in dangerous places, such as cliffs and quarries. Sometimes, they are found on private property. You can't just search for them anywhere. It's best to follow the code on the opposite page and learn how to fossil hunt properly.

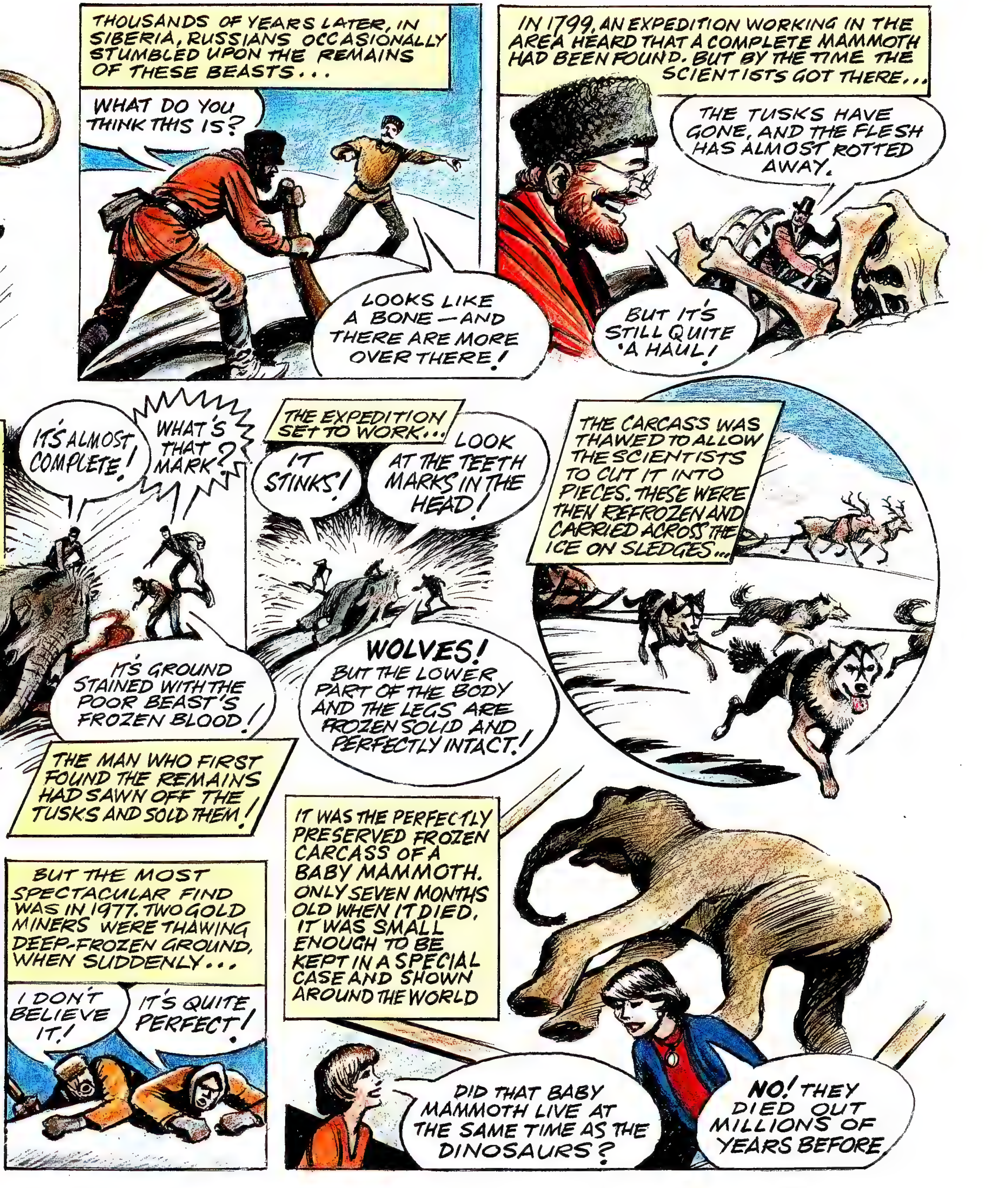


FOSSIL-HUNTING CODE

- **Never** hunt on your own. Go with an adult, or in a special group.
- **Always** get permission before you search on private land.
- **Respect** the countryside. Do not damage plants or disturb wildlife.
- **Fossils** can be damaged if you don't know what you are doing. If you find something, take photographs and seek advice from an expert before attempting to dig anything out. Tell the landowner about your discovery.
- **Take** the right tools and learn how to use them safely. You'll need a hammer and a chisel, a collecting box and a magnifying glass. A camera is useful to record the finds. Take a map to mark where you found them. Put your equipment in a rucksack so your hands are free.
- **Wear** the right clothes: gloves and safety goggles to protect your hands and eyes when hammering; hard hat to protect your head; strong shoes or boots.
- **Never** climb cliffs or rock faces or search in quarries – let experienced adults do that. Be careful not to dislodge rocks which could harm others.
- **Never** collect fossils from walls or derelict stone buildings – they could topple down on top of you.

A MAMMOTH FIND


40,000 YEARS AGO, LONG AFTER THE LAST DINOSAURS HAD VANISHED FROM THE WORLD, A HERD OF WOOLLY MAMMOTHS ROAM THE BARREN SIBERIAN TUNDRA
SUDDENLY, THE GROUND BENEATH ONE BEAST GIVES WAY. THERE IS NOTHING IT CAN DO TO PREVENT ITS FATAL FALL
BY 1860, THE RUSSIAN ACADEMY OF SCIENCES, KEEN TO FIND MORE PREHISTORIC ANIMALS, PUT UP POSTERS ALL OVER SIBERIA OFFERING REWARDS TO ANYONE FINDING THE REMAINS OF EXTINCT ANIMALS
YOU CAN READ, IVAN. WHAT'S IT SAY?
THERE'S A REWARD OF 100 SILVER ROUBLES FOR A COMPLETE SKELETON... AND 300 FOR ONE WITH FLESH AND SKIN ON IT!
HOW CAN THERE STILL BE FLESH AND SKIN?
BECAUSE THEY'VE BEEN DEEP-FROZEN FOR THOUSANDS OF YEARS. WHEN AIR GETS TO THEM THEY THAW OUT AND START TO ROT!
MANY REMAINS WERE FOUND, BUT THOSE DISCOVERED IN 1799 WERE THE MOST COMPLETE UNTIL ONE DAY IN BERESKOY, IN 1901...
WHEN THEY REACHED THE RAILWAY, THE REMAINS WERE TAKEN BY REFRIGERATED CARRIAGE TO ST PETERSBURG, WHERE THE BEAST WAS PUT ON DISPLAY
I THOUGHT THEY DIDN'T FIND THE TUSKS?
YOU'RE RIGHT, VLADIMIR ILYICH, BUT THEY BOUGHT THEM BACK FOR 1,000 ROUBLES FROM THE COSSACK WHO FOUND THE ANIMAL — SADLY, HE GAMBLED THE MONEY AWAY!


THOUSANDS OF YEARS LATER, IN SIBERIA, RUSSIANS OCCASIONALLY STUMBLED UPON THE REMAINS OF THESE BEASTS...
WHAT DO YOU THINK THIS IS?
LOOKS LIKE A BONE—AND THERE ARE MORE OVER THERE!
IN 1799, AN EXPEDITION WORKING IN THE AREA HEARD THAT A COMPLETE MAMMOTH HAD BEEN FOUND. BUT BY THE TIME THE SCIENTISTS GOT THERE...
THE TUSKS HAVE GONE, AND THE FLESH HAS ALMOST ROTTED AWAY.
BUT IT'S STILL QUITE A HAUL!
IT'S ALMOST COMPLETE!
WHAT'S THAT MARK?
IT'S GROUND STAINED WITH THE POOR BEAST'S FROZEN BLOOD!
THE MAN WHO FIRST FOUND THE REMAINS HAD SAWN OFF THE TUSKS AND SOLD THEM!
THE EXPEDITION SET TO WORK...
IT STINKS!
LOOK AT THE TEETH MARKS IN THE HEAD!
WOLVES! BUT THE LOWER PART OF THE BODY AND THE LEGS ARE FROZEN SOLID AND PERFECTLY INTACT!
THE CARCASS WAS THAWED TO ALLOW THE SCIENTISTS TO CUT IT INTO PIECES. THESE WERE THEN REFROZEN AND CARRIED ACROSS THE ICE ON SLEDGES...
BUT THE MOST SPECTACULAR FIND WAS IN 1977. TWO GOLD MINERS WERE THAWING DEEP-FROZEN GROUND, WHEN SUDDENLY...
I DON'T BELIEVE IT!
IT'S QUITE PERFECT!
IT WAS THE PERFECTLY PRESERVED FROZEN CARCASS OF A BABY MAMMOTH. ONLY SEVEN MONTHS OLD WHEN IT DIED. IT WAS SMALL ENOUGH TO BE KEPT IN A SPECIAL CASE AND SHOWN AROUND THE WORLD
DID THAT BABY MAMMOTH LIVE AT THE SAME TIME AS THE DINOSAURS?
NO! THEY DIED OUT MILLIONS OF YEARS BEFORE

Improve and test your knowledge with...

FACT FILE

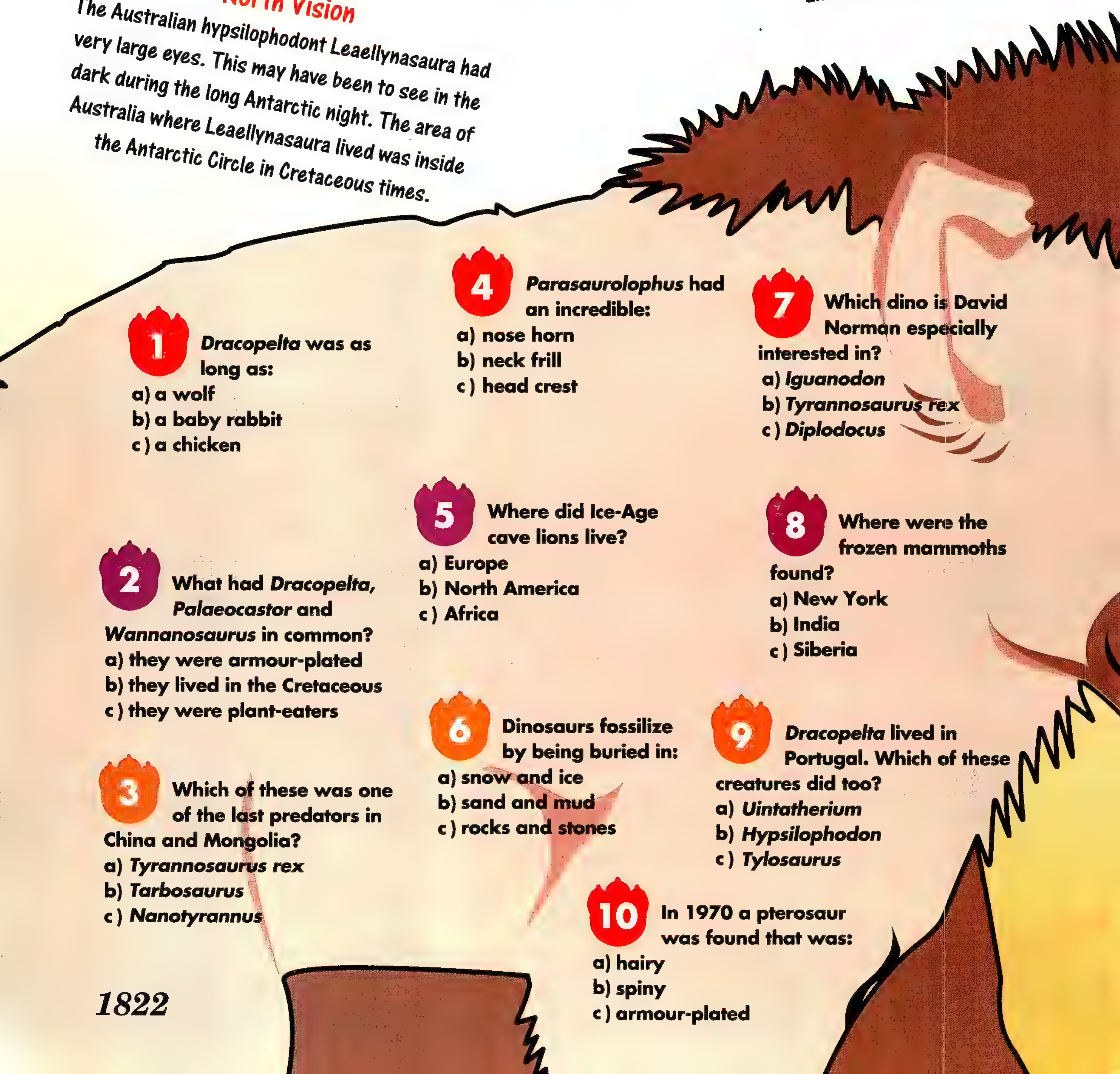
Follow the footprints on the mammoth's back and answer the questions posed.

Early ant

The earliest-known ant was found in a block of Mid Cretaceous amber. It is called Sphecomyrma, and proves that dinosaurs had anthills in their landscape.

North Vision

The Australian hypsilophodont Leaellynasaura had very large eyes. This may have been to see in the dark during the long Antarctic night. The area of Australia where Leaellynasaura lived was inside the Antarctic Circle in Cretaceous times.



1 *Dracopelta* was as long as:
a) a wolf
b) a baby rabbit
c) a chicken

2 What had *Dracopelta*, *Palaeocastor* and *Wannanosaurus* in common?
a) they were armour-plated
b) they lived in the Cretaceous
c) they were plant-eaters

3 Which of these was one of the last predators in China and Mongolia?
a) *Tyrannosaurus rex*
b) *Tarbosaurus*
c) *Nanotyrannus*

4 *Parasaurolophus* had an incredible:
a) nose horn
b) neck frill
c) head crest

5 Where did Ice-Age cave lions live?
a) Europe
b) North America
c) Africa

6 Dinosaurs fossilize by being buried in:
a) snow and ice
b) sand and mud
c) rocks and stones

7 Which dino is David Norman especially interested in?
a) *Iguanodon*
b) *Tyrannosaurus rex*
c) *Diplodocus*

8 Where were the frozen mammoths found?
a) New York
b) India
c) Siberia

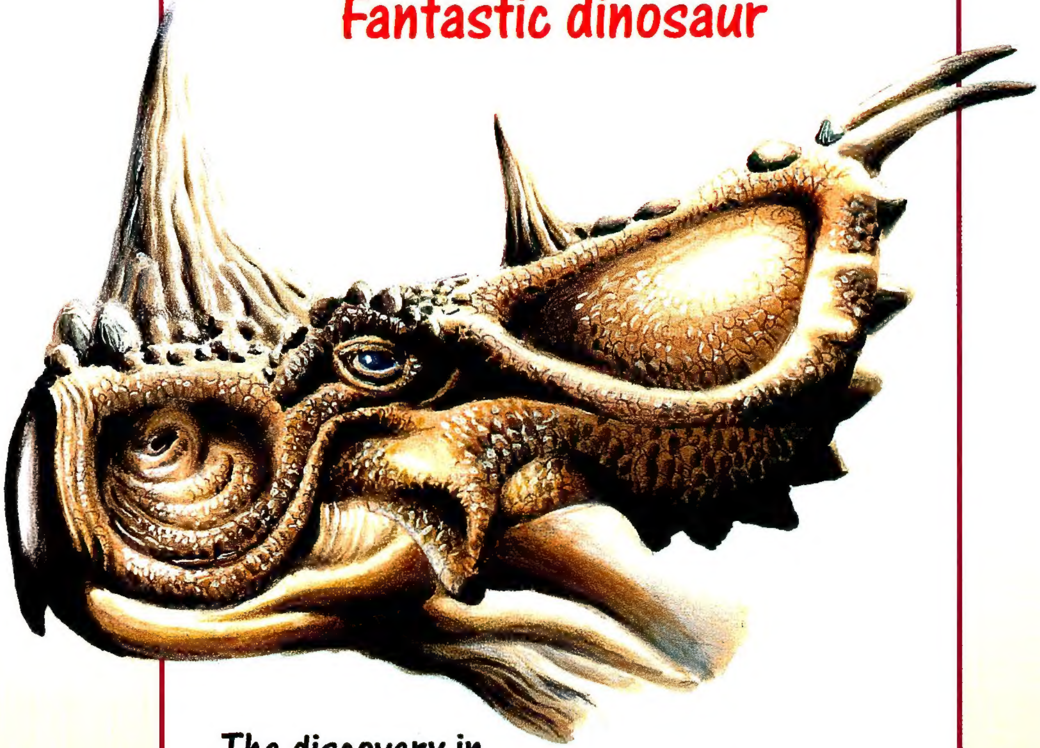
9 *Dracopelta* lived in Portugal. Which of these creatures did too?
a) *Uintatherium*
b) *Hypsilophodon*
c) *Tylosaurus*

10 In 1970 a pterosaur was found that was:
a) hairy
b) spiny
c) armour-plated

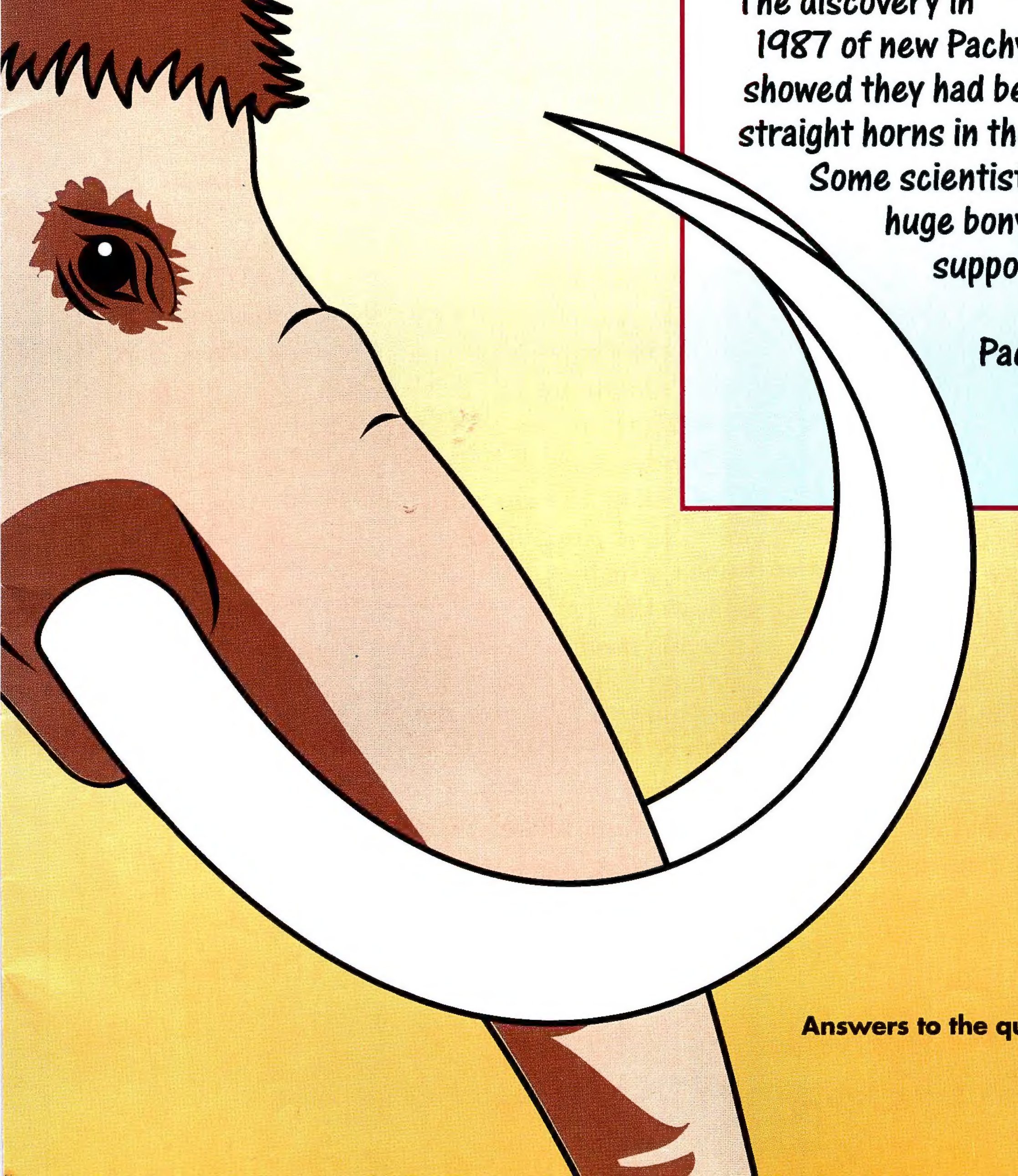
Toothless wonder

Lotosaurus was an early archosaur from the Triassic rocks of China. It had a turtle-like head with toothless jaws and a fin down the back.

Fantastic dinosaur



The discovery in 1987 of new Pachyrhinosaurus fossils showed they had between one and three straight horns in the middle of their frill. Some scientists also believe that the huge bony mass over the nose supported a massive nasal horn, making Pachyrhinosaurus a truly fantastic-looking dinosaur.



Early insect

The oldest insect is a 13cm-long shrimp from the Silurian of Western Australia. It was probably a freshwater hunter.

Answers to the questions on inside back cover

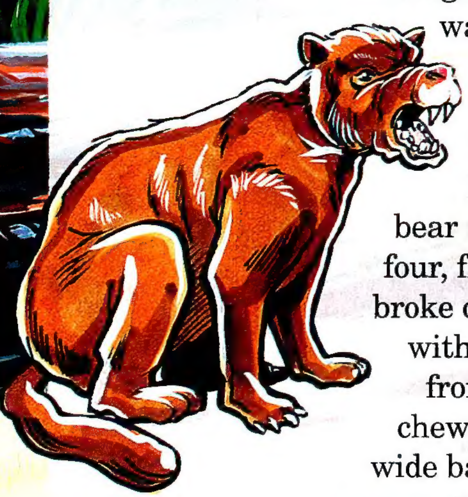
TINTINNOPSIS **RECENT**

Tintinnopsis (tin-tin-op-sis) was a marine protozoan (first animal) that fed on other microscopic sea creatures. It was shaped like a bell with a pointed 'tail' at its closed end. Between 0.1 and 0.2mm long, it was almost too small to see. *Tintinnopsis* propelled itself through the water with the help of fine hairs which moved with a steady beat.

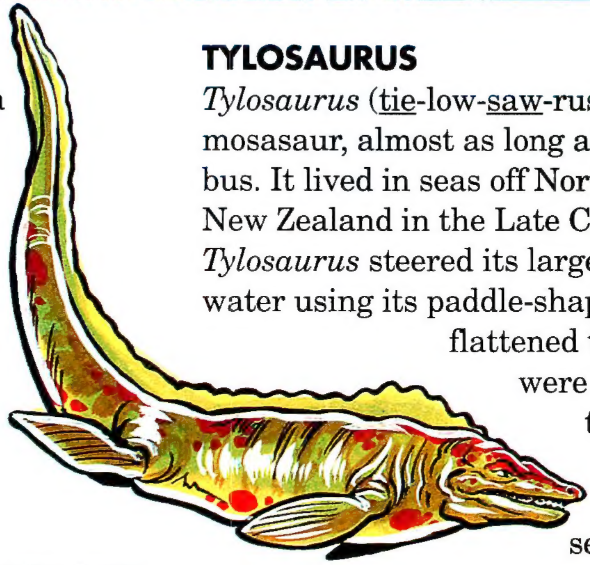
TRITYLODONT **200 MYA**

The tritylodonts (try-tie-low-donts) were the last surviving mammal-like reptiles on Earth. These rodent-like animals lived from the Late Triassic to Early Jurassic times. *Oligokyphus* (o-li-goh-kie-fus), a typical tritylodont, lived in England and Portugal. It was about 50cm long, rather rat-like, with a long tail. It ate plants.

TROGOSUS **45 MYA**



Trogosus (trow-go-sus) was a plant-eater that lived in North America in Eocene times. It looked like a big bear and walked on four, flat feet. *Trogosus* broke off plant stems with chisel-shaped front teeth and chewed them with its wide back teeth.



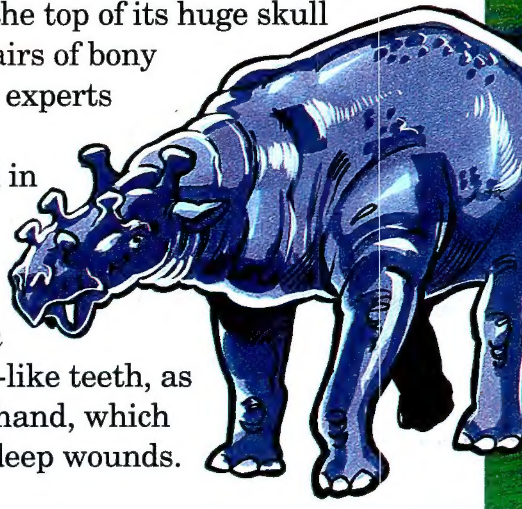
TYLOSAURUS **70 MYA**

Tylosaurus (tie-low-saw-rus) was a large mosasaur, almost as long as a double-decker bus. It lived in seas off North America and New Zealand in the Late Cretaceous Period. *Tylosaurus* steered its large body through water using its paddle-shaped limbs and a flattened tail. Its long jaws were lined with sharp teeth, which it used to trap fish and other sea creatures.

U

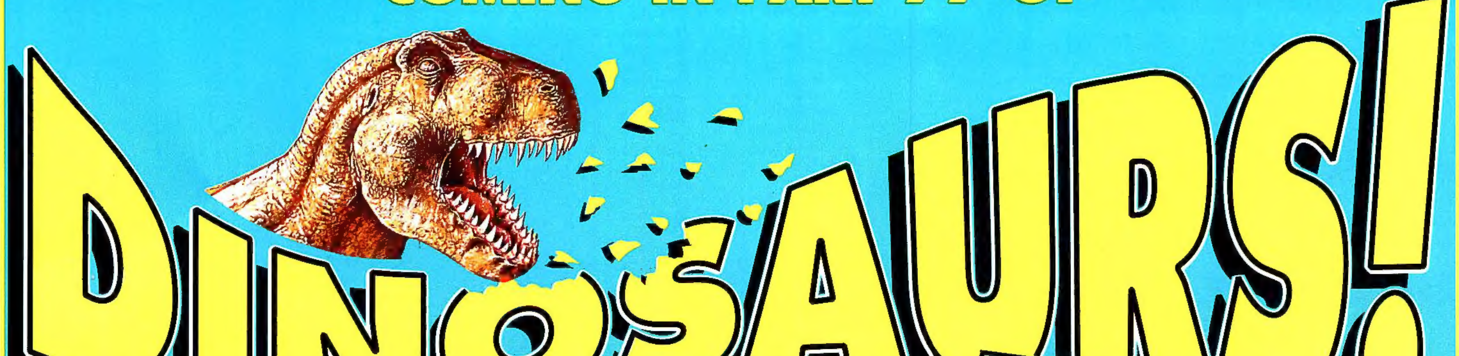
UINTATHERIUM **50 MYA**

Uintatherium (oo-win-tah-thee-ree-um) was one of the first big mammals. Named after the Uinta mountains in Colorado, USA, *Uintatherium* was rhinoceros-sized and lived in Eocene times. It had an extraordinary head. Along the top of its huge skull were three pairs of bony knobs, which experts believe the animals used in jousting contests. Male *Uintatherium* had two fang-like teeth, as long as your hand, which could inflict deep wounds.

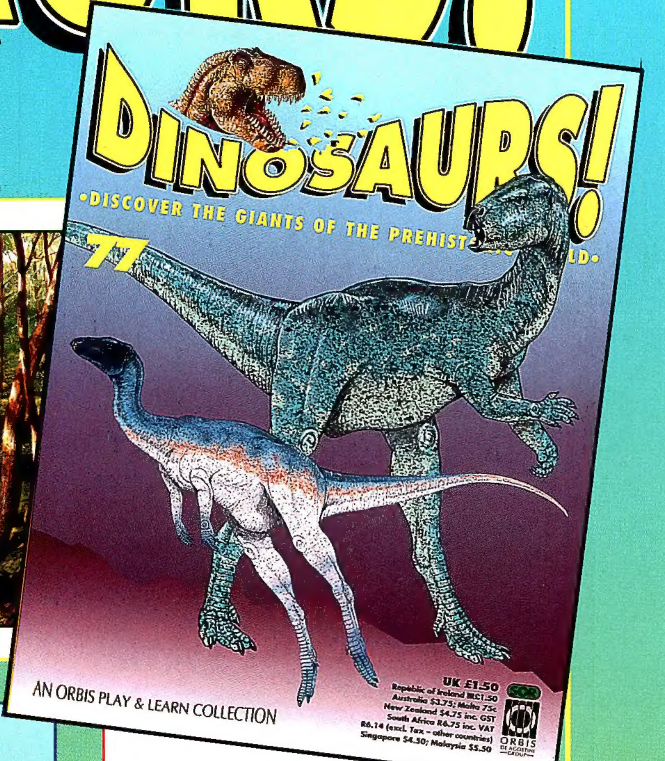


MYA = MILLION YEARS AGO

COMING IN PART 77 OF



DINOSAURS!



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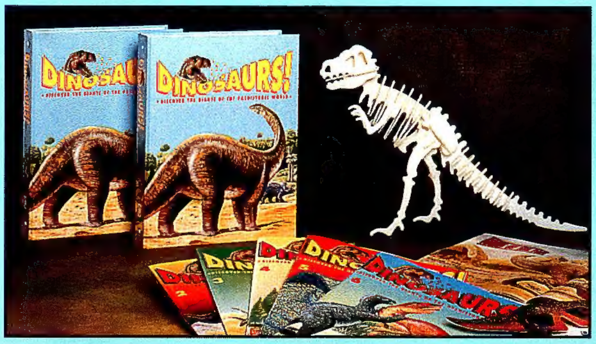

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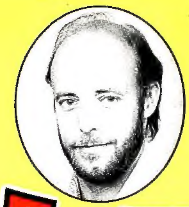
ANSWERS TO FACT FILE QUESTIONS: 1.a 2.c 3.b 4.c 5.a 6.b 7.a 8.c 9.b 10.a

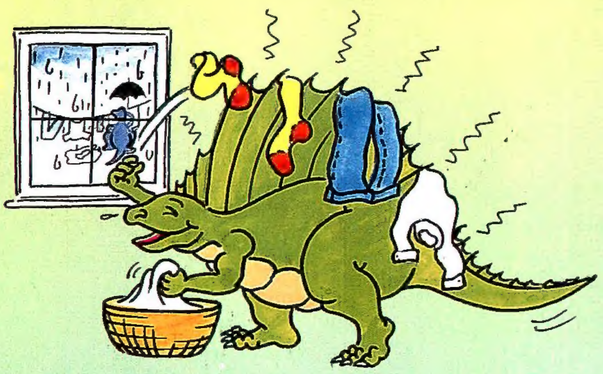
ASK THE EXPERT



Dr David Norman of Cambridge University answers your dinosaur questions

How do we know pterosaurs were hairy?

Experts thought that pterosaurs might be covered in hair. But it was not confirmed until an amazing discovery in 1970. An expert found pterosaur remains in Kazakhstan that were so well preserved the hairs on the skin could still be clearly seen. He named the pterosaur *Sordes pilosus* ('hairy devil'). We now believe all pterosaurs were hairy.

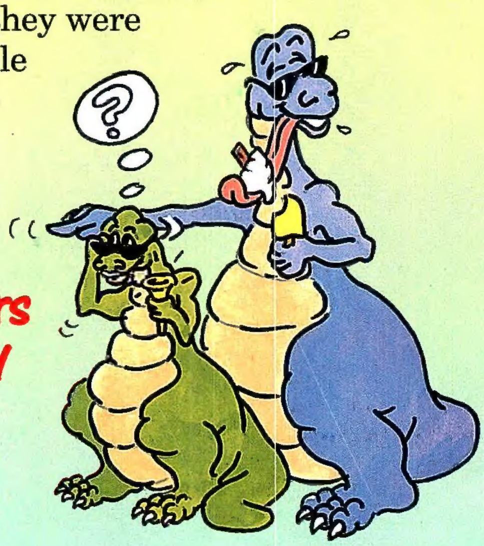


How do we know that Dimetrodon had skin between its spines?

The spines of *Dimetrodon* are pitted in places. This is a sure sign that they had a good blood supply. It is possible that the spines poked up from the back like long fingers, but most experts think that the spines were joined by a web of skin. This meant that the blood could pass across the web between the spines and absorb or radiate heat. But this is only a theory – I cannot prove it without a time-machine!

Could ichthyosaurs make noises like dolphins?

Ichthyosaurs may have used sound to communicate – based on low-frequency vibrations transmitted through the bones of the head, rather than the high-pitched squeals of dolphins. Ichthyosaurs probably made dull creaking and booming noises mostly, but they were certainly not capable of producing sonar-like noises in the way that dolphins can.



Did any dinosaurs have long, sticky tongues, like chameleons?

I think it very unlikely that any dinosaur had a long, sticky tongue – this is only really useful for animals, such as frogs and chameleons, that feed on small insects. We think some dinosaurs ate insects, but the sort of insects that would have interested them were far bigger than ants and flies.

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